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turns more to the north, north-east, and north. When the heavy and long-continued rains that we had during the cruise are taken into account, the testimony of the natives seems to be confirmed, that along this part of the coast of New Guinea, just as in the Archipelago of the Moluccas, the south-east monsoon must be held to be the bad or rainy monsoon; the north-west, on the contrary, for the good or the dry monsoon. This state of the weather is thus the reverse of that which obtains on the great western isles of Sunda.

“The observations taken on board the *Triton* respecting the rise and fall of the tide, and the currents along the coast and from the land, furnish the following results:—In the Princess Marianne Strait a regular rising and falling of the water occurred, though once only in twenty-four hours, and making a difference generally of from  $1\frac{1}{2}$  to  $1\frac{3}{4}$  fathoms. From a series of careful observations made in the bay Oeroe Langoeroe, we learn that at full moon and new moon it is high-water there at 8 minutes past 1 at noon, and low-water at 21 minutes past 7 in the evening. The fall is then 2 mètres.

“This is, however, not the greatest difference between the rising and falling, for when the moon is in her quarters the difference amounts to 2:24. There is ebb twice in twenty-four hours, and flood twice; some irregularity may however be noticed, for occasionally high-water lasts an hour longer than low-water, and the reverse. The current observed along the coast took the same direction as the then prevailing wind; thus north-west, with a rate of about  $\frac{3}{4}$  mile, excepting where interrupted by water flowing from the land, or by bends, banks, or islands. In the Princess Marianne Strait, where the course of the stream depends upon the curves in the banks, its speed was twice as great as in the sea, and therefore  $1\frac{1}{2}$  miles.”

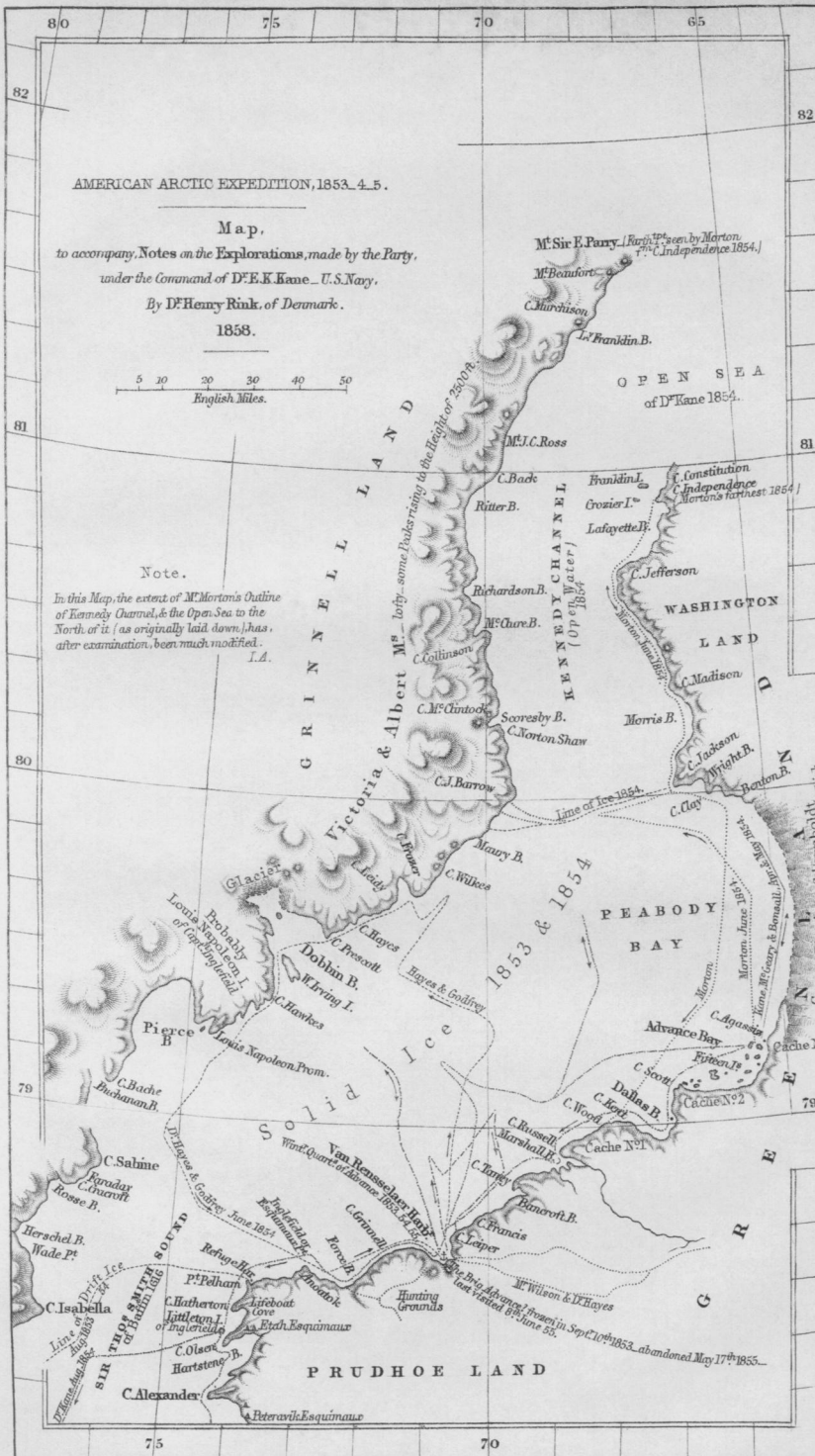
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VIII.—*On the supposed Discovery, by Dr. E. K. Kane, U. S. N., of the North Coast of Greenland, and of an Open Polar Sea, &c.; as described in ‘Arctic Explorations in the years 1853, 1854, 1855.’* By Dr. HENRY RINK, M.D., Inspector in Greenland for the Danish Government.

Condensed from the Danish by Dr. SHAW.

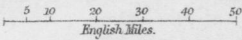
Read, April 12, 1858.

THE author of the work above quoted, makes the following remark in the Introduction: “This book is not a record of scientific investigations;” and adds, that his aim has been to publish a narrative of the adventures of his fellow travellers, and that he has attempted very little else. Nevertheless, on perusing this



AMERICAN ARCTIC EXPEDITION, 1853-4-5.

Map,  
to accompany Notes on the Explorations, made by the Party,  
under the Command of D<sup>E</sup> E. K. Kane - U.S. Navy,  
By D<sup>r</sup> Henry Rink, of Denmark.  
1858.



Note.

In this Map, the extent of M<sup>r</sup> Morton's Outline of Hermedy Channel, and the Open Sea to the North of it (as originally laid down) has, after examination, been much modified.  
I.A.

M<sup>r</sup> Sir E. Parry (Route taken by Morton 17<sup>th</sup> Independence 1854.)

OPEN SEA of D<sup>r</sup> Kane 1854.

WASHINGTON LAND

PEABODY BAY

PRUDHOE LAND

Great Glacier of Humboldt its perpendicular face is 300 to 500 ft high

promised "simple story" of a voyage, we find it embellished with scientific theories extending far beyond the bounds of such a narrative. As these speculations relate to a subject, the examination of which has occupied me during nine years, namely, the Physical Geography of Greenland, I feel called on to subject them to a somewhat closer inquiry. As his richly and elegantly illustrated work has awakened great sensation, nay even partly placed the other Polar expeditions in the shade, I am led to think that a communication of my views respecting this matter will not be entirely without interest to the Society.

It is well known that the active and undaunted American traveller, Dr. Kane, unfortunately so early carried off, attempted, in the year 1853, to go farther north up Smith Sound, than Captain Inglefield, the year previously, had done; but that he only succeeded in taking his ship a trifling distance farther than Inglefield; that he was then frozen in, lost his ship, and in the year 1855 saved himself and party by returning, in boats, to the Danish colony of Upernivik. From his two years' winter quarters in Van Rensselaer Bay, on the east side of the Sound, he, by the help of dog and drag sledges, undertook expeditions in different directions, partly across to the American side, but mainly along the coast, pursuing it northward, to find, if possible, the northern end of Greenland.

What was discovered on these tours must be regarded as the real profit of the expedition, and I will here confine myself to the two points which have cast the chief lustre over the expedition. *First*, that which concerns the unknown interior of Greenland, the glaciers and floating icebergs that issue thence, about which the author expresses himself on occasion of having discovered a glacier on the coast of Greenland, between  $79^{\circ}$  and  $80^{\circ}$  N. lat., to which he has given the name of Humboldt. *Secondly*, a sledge expedition undertaken by Morton (one of the ship's crew who it seems was steward), in conjunction with Hans, a Greenlander from Fiskernæsset; whereby they are said to have come to the margin of an *open* sea, which is presumed to occupy the whole region around the North Pole, and to be kept open by a branch of the Gulf-stream; and besides this, to have discovered the most northern lands on our globe, which, according to their description, are likewise laid down on the chart and called "Victoria and Albert," "Washington," &c., Lands.

As regards the first of these points, I must repeat what I have explained in my work on North Greenland,\* namely, how the whole of the inner mainland, regarded from the outer land, appears buried under one uniform covering of ice, which sends its branches

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\* 'De Danske Handelsdistrikter i Nordgrønland.'

down into all deep fiords; how these branches are pushed down into the sea, and yield annually large masses of ice in the form of floating icebergs or calves. The glacier discovered by Kane, which he has named "the great glacier of Humboldt," and which has called forth much admiration, even in well known geographical journals, has been represented as the crowning point of the discoveries made by the expedition, but which is really nothing more than what can be observed in the interior of most of the Greenland fiords, from the southernmost to the most northern reached point.

The reason why Kane has not had an opportunity to observe these, and that the one discovered by his expedition has therefore appeared to him so remarkable, lies in the simple fact, that such ice formations in general lie hid behind the numerous high islands and peninsulas, which almost form the outer coast of Greenland towards Davis Strait, and which, with regard to snow and ice, do not show any other phenomena than the higher parts of the mountain chains of Europe.

Now as the different discovery-ships, that have sailed in search of the North-west Passage and of Franklin, have always rapidly hurried through Davis Strait, and have only touched at one or other of the Danish Colonies, it is no wonder that the numerous remarkable ice-fiords, which require a longer time to travel through and examine, have more or less escaped attention. Kane had thus either not seen these ice formations, or only had an occasion of seeing them from a great distance, before he came to the place where he was frozen in and had to pass two winters. Humboldt glacier does not even seem to belong to the most remarkable among them, as even in the very southernmost of our Greenland districts, at Julianehaab, we have opportunities of observing just as remarkable phenomena of this kind.

With respect to the *second* point—namely, the *Open Polar Sea*, discovered by Morton the steward, and the Greenlander Hans—the manner in which Morton's journey is described by Petersen,\* the Dane, who accompanied the expedition as interpreter, seems to give a clearer picture of its result than that which Kane has sketched.

This discovery of an Open Sea gives Kane occasion to make a comparison with other Polar expeditions, and he goes as far back as the days of Barentz in 1596, and "without referring to the earlier and more uncertain chronicles," he mentions the Dutch

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\* See vol. i. pp. 280-310. Petersen is a man well known to me. He was appointed foreman in the trading service at Upernivik. His communications bear the full impression of truth, and are written in a clear and simple style, without boasting and self-praise, although he has been of great service to the expeditions that he accompanied as interpreter—viz. Penny's and Kane's. He is now serving with Capt. M'Clintock.

whale fishers, Dr. Scoresby, Baron Wrangel, Captains Penny and Inglefield, and shows how they have all spoken about large openings in the ice around the North Pole. He shows likewise how these have all been found to be "illusory discoveries," and anticipates the objection that "his own may one day pass within the same category" by extolling the far larger scale on which *his Open Sea* has been observed. Petersen confines his remarks on this subject to the following :

"The Greenlander, Hans, was sent after them with the dog-sledge in order to continue the journey still farther towards the N., and when he reached their sledge (*i. e.* a drag-sledge that had been sent out earlier), he and the steward Morton proceeded onwards. They reached the Sound of which the Esquimaux had spoken. This Sound was open ; probably cut up by the strong current they had observed there. It was, however, Midsummer, so that the sun had perhaps aided the current in getting away the ice. After this expedition no other such was attempted." \*

It is a known fact that here and there under the coast of North Greenland, places are found which, on account of the strong current, do not freeze, even in the severest winter, although the whole waters round them are covered with ice of two to four feet thick, and Kane himself remarks, that in the most rigorous cold he has found such stream-holes. As soon as the Spring commences these stream-holes expand themselves, as the ice in their neighbourhood is always thinner and sooner thawed, either above, by the sun, or below, by the under current.

Now, as Morton's expedition was undertaken at Midsummer, and as he found such an opening in the ice, not more than 90 miles from the place where they, the year before, had been able to navigate the vessel, and as there was an unusually strong current running in this opening, which just appeared where the Strait became smaller, nothing is more probable than that this opening was just such a stream-hole, in which opinion I must concur with Petersen, until stronger proofs be adduced in favour of the hypothesis of an Open Polar Sea, kept open by a branch of the Gulf-Stream deflected from Nova Zembla to the Pole :—a solution of a problem which has occupied Geographers since 1596, if not farther back, &c. &c.†

Next, as to what concerns the lands that are said to surround this enigmatical Sea with a coast of 90 to 130 miles in extent, which Morton measured almost at a single glance, and which Kane has been able to lay down on his chart, even with an exact coast margin, adorned with celebrated names, and accompanied in the text with correct statements of the heights of Mountains (Mount Parry), &c., &c., I must express a well founded doubt of the correctness of all this.

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\* See 'Erindringer fra Polarlandene,' p. 92.

† See Kane's 'Considerations,' vol. i. pp. 301-309.

The ship, as stated, was frozen in on the coast of Greenland, in  $78^{\circ} 37'$  N. lat., in the beginning of September, 1853. Of the expeditions that were sent out the same Autumn with boats or sledges, one reached, as presumed,  $79^{\circ} 50'$  N. lat. along the same coast. In March, 1854, Dr. Kane sent out a sledge expedition, which was obliged to return without result; the eight travellers who took part in it were in the greatest danger of being frozen to death; three of them had a foot or toes amputated, and one died a few days after his return. Of the later expeditions, the one under Dr. Hayes was directed towards the opposite, or American coast, which he traversed to  $79^{\circ} 45'$  N. lat. under great sufferings from snow-blindness. The others kept under the coast of Greenland, and did not get farther than Humboldt glacier, or about  $79\frac{1}{2}^{\circ}$  N. lat.; with the exception only of the one undertaken by Morton and Hans, who, according to their own statement, reached  $81^{\circ} 20'$  N. lat., from which point they supposed they had seen land as far as  $82^{\circ} 30'$  N. lat.; these two members of the expedition alone came to the *Open water*. The breadth of the whole of the northernmost part of Baffin Bay, thus explored, was from 8 to 16 geographical miles between the coasts of Greenland and America.\*

After the first excursions in the vicinity of their winter quarters, attention was directly drawn to the great Humboldt glacier, and Kane had an occasion, one clear day in April, to survey it closely; and then remarks:—

“ My notes speak simply of the ‘ long ever shining line of cliff, diminished to a well-pointed wedge in the perspective;’ and again, of ‘ the face of glistening ice, sweeping in a long curve from the low interior, the facets in front intensely illuminated by the sun.’ But this line of cliff rose in a solid glassy wall, 300 feet above the water-level, with an unknown, unfathomable depth below it; and its curved face, 60 miles in length from Cape Agassiz to Cape Forbes, vanished into unknown space at not more than a single day’s railroad travel from the Pole. The interior with which it communicated, and from which it issued, was an unsurveyed *mer de glace*, an ice-ocean, to the eye, of boundless dimensions.

“ It was in full sight—the mighty crystal bridge which connects the two continents of America and Greenland. I say continents; for Greenland, however insulated it may ultimately prove to be, is in mass strictly continental. The least possible axis, measured from Cape Farewell to the line of this glacier, in the neighbourhood of the 80th parallel, gives a length of more than 1200 miles, not materially less than that of Australia from its northern to its southern Cape.

“ Imagine, now, the centre of such a continent, occupied through nearly its whole extent by a deep unbroken sea of ice, that gathers perennial increase from the waterparting of vast snow-covered mountains, and all the precipitations of the atmosphere upon its own surface. Imagine this, moving onward like a great glacial river, seeking outlets at every fiord and valley, rolling icy cataracts into the Atlantic and Greenland seas; and, having at last reached

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\* See vol. i. pp. 225-228.

the northern limit of the land that has borne it up, pouring out a mighty frozen torrent into unknown Arctic space.

"It is thus, and only thus, that we must form a just conception of a phenomenon like this great glacier. I had looked in my own mind for such an appearance, should I ever be fortunate enough to reach the northern coast of Greenland. But now that it was before me, I could hardly realize it.

"I had recognized, in my quiet library at home, the beautiful analogies which Forbes and Studer have developed between the glacier and the river. But I could not comprehend at first this complete substitution of ice for water. It was slowly that the conviction dawned on me, that I was looking on the counterpart of the great river-system of Arctic Asia, and America. Yet, here were no water feeders from the south. Every particle of moisture had its origin within the Polar circle, and had been converted into ice. There were no vast alluvions, no forest or animal traces borne down by liquid torrents. Here was a plastic, moving, semi-solid mass, obliterating life, swallowing rocks and islands, and ploughing its way with irresistible march through the crust of an investing sea."

As Kane, in this section of his work, just expatiates upon the nature and quality of the whole of Greenland and its unknown interior, it is chiefly at this place that I must refer to my previously cited work; in the first section of which, at page 10, I have treated on the extension of the land-ice, and the origin of the floating icebergs. But as the subject is rather comprehensive, I will here confine myself to the following remarks:—

The interior, with which the glacier stood in connection, was: "an ice-ocean, to the eye, of boundless dimensions." That this ice-ocean could not be overlooked at that place certainly does not signify much with regard to its extent; but farther on, he remarked that it occupies the whole centre of Greenland, right down to Cape Farewell. Now, from what source does the author know this, as he only cites a few places, quite in the neighbourhood of his winter harbour, where he has followed the margin of the inland ice, and had never been in the fiords of Greenland, between Upernivik and Cape Farewell? I for my part have employed 8 years in examining to what degree the interior was covered with ice, by pursuing it from fiord to fiord; and nevertheless I have been obliged to confine myself to conjecture, with regard to many extensive tracts that lie between these fiords; and my own explorations in this direction, must, as we shall see, be supposed to have been unknown to him. In the account of his first voyage,\* he says of the Omenak fiord, that he could see into its mouth whilst sailing up the Strait; that its interior had never yet been explored, and that there was great probability that it passed right through the country to the Atlantic Ocean. But if we admit this central ice-ocean as existing, what does it then signify? that this ice-ocean moves like a great ice-river (from south to north?), rolling cataracts of ice out to both sides in the Atlantic and Green-

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\* 'Grinnell Expedition,' 1854, p. 53.



land seas, until it reaches the northern boundary of the country, and there pours forth a mighty frozen stream, Humboldt glacier, in that unknown Arctic space? I cannot follow the author in his bold flight over the icy desert of Greenland, and still less can I conceive that he, in all this, only sees a confirmation of what he had already earlier foreseen in his own mind, if he "*should ever be fortunate enough to reach the northern coast of Greenland,*"—that which he presumes to have discovered on this expedition. The reality is, that wherever one attempts to proceed up the fiords of Greenland, the interior appears covered with ice; but there is no reason whatever to assume that this applies to the central part of the country, in which one, on the contrary, just as well may assume that there are high mountain-chains, which protrude partly from the ice. A remarkable movement is found in this ice-mass; but this is so far from having a kind of main direction after the central axis of the land towards the Humboldt glacier, that this arm of the ice, on the contrary, seems to belong to those that are in a less degree of motion, whereas the greatest agency takes place around Jakobs-havn ice fiord, Omenak fiord, and others. Farther, this movement can only be measured by the masses of ice that pass annually out of these fiords, and of which one can only obtain a tolerable conception by remaining for a long time at the mouths of the fiords. These ice-fiords point out probably the rivers of the original land, now buried under ice. Whereas no conclusion can be drawn from the ice itself and the appearance of its branches that go down to the sea, for it is almost quite uniform everywhere, from Julianehaab to Upernivik.

The author, in concluding his remarks, says it was first when he saw Humboldt glacier that Forbes's and Studer's idea of the likeness between the glacier and the river began slowly to dawn on him; but the same species of glacier, which these celebrated naturalists have examined on the Alps and in Norway, is found in many places on outer-Greenland, or what I would call ice-free Greenland. These Kane had seen at Disko, near Upernivik, and other places, before he reached "Humboldt glacier." In order to examine its signification in comparison with the rest of the branches of inland ice, he must have made observations and calculations of how many icebergs it annually yielded to the sea, as from its appearance he could scarcely form any opinion. By seeing such a branch of inland ice, on account of the uniform ice-plateau whence it issues, one gets a smaller impression of its similarity with a river than by seeing the Alpine glaciers and the glaciers on the outer coast of Greenland, as these just fill up cliffs which—to judge from their form—must be beds of watercourses. Those arms of inland ice, which send scarcely any ice into the sea, show, on the contrary, about the same appearance as those that send out annually thou-

sands of millions of cubic feet of ice into the sea, and therefore must be supposed to be maintained by river territories of many hundred geographical square miles.

I now proceed to examine its signification as a sort of connecting link between Greenland and the American continent. Dr. Kane says "it was in full sight—the mighty crystal bridge which connects the two continents of America and Greenland;" and afterwards, in a note, "I have spoken of Humboldt glacier as connecting the two continents of America and Greenland. The expression requires explanation, &c." Difficult as it is to understand, Dr. Kane seems to mean that Greenland is separated from, and therefore half connected with, the Arctic-American Archipelago by a less broad Sound, beyond Humboldt glacier.

Petersen says, that Kane himself would have undertaken an excursion to the north in the middle of April, 1855, but that he could not get the Esquimaux to accompany him, as they would only go bear-hunting around the ice-cliffs near Humboldt glacier, and thus Kane was only absent 24 hours on this tour. Kane says that as he could not reach the Open Water, he sought compensation in a closer examination of the great glacier, of which he now again takes occasion to give a lively description, concluding with the following allusion to the previously-mentioned idea of the connection between Greenland and America:—

"Thus diversified in its aspect, it stretches to the north till it bounds upon the new land of Washington, cementing into one the Greenland of the Scandinavian Vikings and the America of Columbus."

In the earlier sections there is spoken of the extension and movement of the inland ice: here is specially mentioned the manner in which the floating icebergs tear themselves loose from that side which goes out to the sea—the *calvings*, as they are called in the ice-fjords. None of those engaged in the expedition had had an opportunity to make direct observations in these respects. In order to obtain the necessary prospect, Kane climbed up "one of the highest icebergs," whilst his fellow-travellers rested themselves. From here he meant he could see that

"The indication of a great propelling agency seemed to be just commencing at the time I was observing it."

It appeared to him as if the split-off lines of the fast land ice, which signify the beginning of the loosening, were evidently about to extend themselves. As the *calving*, however, did not follow, Kane confines himself to remark respecting it—

"Regarded upon a large scale, I am satisfied that the iceberg is not disengaged by *debâcle*, as I once supposed. So far from falling into the sea, broken by its weight from the parent glacier, it rises from the sea."

He next adds that

"The idea of icebergs being discharged, so universal among systematic

writers and so recently admitted by himself, seems now to him at variance with the regulated and progressive actions of nature."

By this I conclude that Dr. Kane had not seen my work on North-Greenland, or, at all events, that part of it which treats of the extension of the land-ice and the origin of the floating icebergs, and wherein it states—

"But from what has been already mentioned, it must be evident that the icebergs must not be considered as breaking loose and falling down from precipices; one might rather say that they lift themselves," &c. &c.

That Kane did not know this is certainly very striking to me, as the literature which treats of the glaciers of the Polar lands, and especially those of Greenland and the origin of the icebergs, is not great. Dr. Kane had sought information respecting the nature of the country in our Danish colonies, and as my above-mentioned work is cited in his own, if not by himself, still by his assistant, Charles Schott, in the Appendix XIII., p. 426.\* He says also, at page 150, that the height of the ice-wall at the nearest point was about 300 feet, measured from the water's edge. As a consequence thereof the floating icebergs, which lay before it and were detached from this ice-wall, must have been, on the average, above 300 feet, if they should be imagined as formed by an elevation during the time of being detached.

I have accurately measured many frozen icebergs, particularly in the winter, on Omenak fiord, and I have thereby come to the result that the common height of the larger ones, and especially of those that may be supposed to lie, in some measure, in the original position which they had had after their breaking loose, was somewhat more than 100 feet. I have also measured them as high as 150 feet, and I have seen some that I should estimate at 200 feet high; but this was when there were points or edges that had come to jut upwards by the mighty ice-block having turned and changed its position in the water. That the whole of the collected mass of icebergs before the Humboldt glacier should have been considerably more than 300 feet in height generally—the highest, consequently, even 500 feet—I can certainly not disprove; but I must strongly doubt.

We now come † to the remarkable sledge expedition of Morton and Hans, on which they first passed the whole exterior margin of the great glacier, with the icebergs lying before, and those torn from it and floating about; they then drove farther towards the north, found the ice more and more unsafe, and were at last interrupted by the Open Sea, when they drove some distance along the shore, and lastly Morton went alone on foot as far as he could to

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\* See also Journal of Royal Geographical Society, vol. xxiii. p. 145.—Ed.

† See vol. i. pp. 280-310 of Kane's Work.

obtain a survey of the navigable water farther towards the north. The whole journey, from the moment they saw the Open Sea until they were compelled to return, after a very difficult passage, during which they were also bear-hunting, lasted only three days, or from the 21st to the 24th of June.

What Morton saw in these three days is the foundation for the whole theory of Kane's Open Polar Sea, and whatever stands in connection therewith. Kane gives us this account with his own explanations, and in a separate Appendix he has communicated Morton's own journal. It is stated that this man had instruments with him to determine the geographical positions. As far as I can judge from the chart, as laid down in the first volume, and from the Appendix No. VI.,\* more than 20 points of longitude and latitude are determined by him on that toilsome journey beyond the Humboldt glacier, besides the numerous points on the opposite coast, to which they did not come, and which, therefore, appear to be laid down only after bearings.

When I consider the great haste required to reach the farthermost point towards the north, and to return before the ice broke up, the very difficult and toilsome passage through deep snow, over openings, the most trackless ice-walls, &c. &c., I cannot sufficiently admire Morton's dexterity in attending at the same time to these observations which require so much repose and accuracy.

The travellers drove past the floating icebergs that were torn loose from the glacier and lay piled up before it. Several reasons are adduced to show that it could be ascertained that they were formed or torn loose very recently, as they had a fresh shining surface and no projecting foot under the water. It is, however, especially from the accounts given of this place, that I conclude that the Humboldt glacier does not belong to the most active of the inland ice-streams of North-Greenland. The icebergs lay only a few Danish miles out from the fast land ice, and one must consider that they have perhaps taken several years to be filled up, as all the navigable waters thereabout were frozen; they could scarcely come out any other way than towards the south, and this passage perhaps opens only now and then in different years. The great ice-fjords that are known in North-Greenland are annually cleared of great masses of ice, that are driven to sea. If this were not the case, the inner navigable waters would soon be stopped up, and the incessantly-propelled land-ice extend itself over the surrounding land.

After having passed the icebergs, they came to the place where the sea-ice on which they drove became thinner and thinner, so that the dogs trembled, and at last they durst not drive farther on

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\* The *astronomical* observations obtained by Morton are three meridional altitudes of the sun.—ED.

it, but sought the land, or rather the firmer ice-edge that lay immediately along the shore. At last the ice gave place for quite open water, and here it is stated, at page 288, that—

“The tide was running very fast; the ice-pieces of heaviest draught floated by nearly as fast as the ordinary walk of a man, and the surface-pieces passed them much faster, at least four knots.”

Kane has already given an excellent description of a stream-hole; but had it been the margin of the Open Sea moved by the swell, the ice would have kept its thickness, at least to some extent, just as one approached it, but it would have been broken, screwed up, and thus more or less in drift. In short, such a margin of ice is cut off sharper, with respect to thickness, whereas a successive transition from ice to water is found around a stream-hole, for which reason it is so dangerous to approach such places. The above-mentioned tide-stream of four knots is even so strong, that one (particularly as it was in a pretty large sound, and not in a narrow pass of some few yards in breadth) can already conclude that in such a place no ice would be able to hold in the month of June, even to a considerable circumference. Even farther up Morton observed that the ice-pieces drifted at the rate of four miles an hour, and that the stream varied first from north to south and then from south to north, just as is the case everywhere in the inner navigable waters along the coast of Greenland, originating from the ebb and flood. (*See* vol. ii., p. 376.)

The last-mentioned observation was made by Morton on the 22nd of June, consequently there was not until that moment the most remote reason to suppose an Open Polar Sea. The Sound had likewise a direction north, and there was thus no sign whatever that the coast under which they found themselves turned towards the east, or that they found themselves *at the end of Greenland*. We will now consider the adventures of the two following days, after Morton's own description (vol. ii., pp. 377, 378). These adventures form the main foundation for the ideas about the end of Greenland—the Open Polar Sea—the Gulf-stream, which warms up the Pole—the solution of that problem which has occupied the geographical world since 1596, &c. &c.; and with these must stand or fall the whole of that splendid building, of which Kane has sketched a drawing in vol. i., pp. 301-309.

On the 23rd of June Morton and Hans started, but not before noon, in consequence of a continued gale from the north, but after driving about 6 English miles they found the ice along the coast quite broken up and impassable. They therefore made a halt with the sledge, and undertook a journey on foot, but returned and encamped by the sledge.

The following day, the 24th of June, they started on foot very early in the morning; their intention was to come past a high

cape, behind which there was still hope that they could get a free prospect towards the east, and thus see the end of Greenland. After a very toilsome wandering, as they were sometimes obliged to crawl over cliffs and sometimes to spring over loose floating pieces of ice, they fell in with a she bear and her cub, which they killed, and then boiled a strengthening dish of the flesh on the spot, as they found some plants and a piece of a sledge, whereof they made a fire. As yet nothing was discovered that could lay the foundation to the above named theories, and nevertheless all was to be attained before the following day. On account of the importance of the events that occurred between, I will give Morton's statement, as it will be found in the place cited :—

“ After this delay (the bear-hunting) we started in the hope of being able to reach the Cape to the north of us. At the very lower end of the bay there was still a little old fast ice over which we went without following the curve of the bay up the fiord, which shortened our distance considerably. Hans became tired, and I sent him more inland where the travelling was less laborious. As I proceeded towards the cape ahead of me the water came again close in-shore. I endeavoured to reach it, but found this extremely difficult, as there were piles of broken rocks rising on the cliffs in many places to the height of 100 feet. The cliffs above these were perpendicular, and nearly 2000 feet high. I climbed over the rubbish, but beyond it the sea was washing the foot of the cliffs, and, as there were no ledges, it was impossible for me to advance another foot. I was much disappointed, because one hour's travel would have brought me round the cape. The knob to which I climbed was over 500 feet in height, and from it there was not a speck of ice to be seen. As far as I could discern the sea was open, a swell coming in from the northward and running crosswise, as if with a small eastern set. The wind was due north—enough of it to make white caps—and the surf broke in on the rocks below in regular breakers. The sky to the north-west was of dark rain-cloud, the first that I had seen since the brig was frozen up. Ivory gulls were nesting in the rocks above me, and out to sea were mollemoke and silver-backed gulls. The ducks had not been seen north of the first island of the channel, but petrel and gulls hung about the waves near the coast.”

“ June 25.—As it was impossible to get around the cape I retraced my steps,” &c. &c.

With this, the exploration of the open Polar Sea,\* and the farthest lands on our globe, was ended. Morton felt himself disappointed in not being able to come past that terrible Cape, which hid his prospect towards the east. I, for my part, was not disappointed on reading that such a hindrance arose before him. I know it

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\* With reference to the latitude of the northernmost point reached by Morton, he states in his Journal, p. 378, vol. ii., “ We arrived at our camp where we had left the sledge at 5 P.M., having been absent 36 hours, during which time we had travelled twenty miles due north of it. June 26th.—Before starting I took a meridian altitude of the sun.” This observation is worked at page 388 in the same volume, where the result appears as .. .. 80° 20' 2"

Add 20 miles according to the above remark .. .. 20 0

Latitude of the farthest point reached by Morton .. 80 40 2

from sad experience, as I, during three consecutive winters, have followed the winding coasts of North Greenland in dog sledges, in order to lay them down on my chart. I know these bewitched points which continue to shoot forth when one thinks one is at the end of an island, these endless promontories which one must come past before one can reach the right promontory, and can turn round; these hills—these eternal tops—that shoot up when one ascends the cliffs, before one reaches the right top, whence one can have the wished-for prospect. I have passed half a day thus only to get the wished for general view over one single fiord-arm, and that even sometimes in vain. What must it then not be, when one on an afternoon, and on foot, seeks to reach the unknown end, to use Kane's own words, of a "whole little Continent?"

We will now return to Kane's representation, and, on account of its considerable extent, confine ourselves to inquire into the most important conclusions, through which he comes to such great results from the facts communicated above.

Dr. Kane remarks in several places, that although it blew a strong and almost stormy north wind during those days when Morton travelled along the open water, there came only some few half-dissolved pieces of ice drifting from the north, and at last none at all. This shows, if one will draw any conclusion whatever from it, that the navigable water, a good way from the mouth of the narrow pass, in which the stream was so extremely rapid, had been covered with *still good winter ice*. For if it were really on the border of the open sea one might expect to find much loose drift-ice between the margin of the fast ice over which they had driven, and the quite open sea; and there was a great probability that such drift-ice must appear and press on during a continued north wind. A sudden beginning of a perfectly ice-free sea is scarcely to be imagined.

An important criterion whereby to judge if one has open water, is the *ground-swell* of the sea. This is seen at Julianehaab, when the ice from the east coast is expected in the spring. To look after the ice itself from hills of some hundred feet in height is not of much use, for if it be first in sight it is also very near, and in a short time is on land. But in general one can know its proximity by the cessation of the ground-swell several days beforehand. To observe this with certainty the weather must be quite still, for the swell which even a common wind produces makes the observation uncertain. Kane adduces the swell and surge as proofs of the Open Polar Sea; but as it is expressly stated that *it blew almost a storm the whole time*, the effects of such a storm on an open surface of the sea, of possibly 20 or 30 miles in extent, are sufficient to make the presumed observation perfectly invalid.

Still more uncertain does the observation of Morton appear to me, that the swell caused by the wind from the north, which he pretends to have remarked from the farthermost point of land, was acted on by another swell from the east, behind that Cape which concealed the end of Greenland and the beginning of the great Polar Sea from his view.

A third fact which Kane adduces in favour of his theory of the Polar Sea, is the increasing abundance of animals and plants in the district to the north of the glacier. It is mentioned in particular that seals and sea-fowl were seen in great numbers in, as well as around the neighbourhood of, the open water. Passing over the more cursorily touched observation, that the birds flew in an eastern direction behind the oft-mentioned Cape which Morton could not come past, I shall only remark that I, on the contrary, regard that flocking together of sea animals and birds as a sign of one single opening in the sea, the rest of which was covered with ice. Such openings are just characteristic gathering places for seals and sea-fowl. Nor do the plants which the Greenlander Hans is said to have seen, but no specimens of which were collected, and which, from his bare description, are determined and inserted with Latin names of their genera and species at page 462, appear to afford any weighty proof of the Open Sea and an increasing mildness of climate towards the North Pole.

I now come to the real question, the *knob* to which Morton climbed when he could not come farther, and from which he, "as far as he could discern," found the sea *Open*. He says that it was over 500 feet in height, though he likewise remarks that the cliffs around, to a height of 100 feet, which were difficult to reach, were quite perpendicular. As far as I can make out, this is the same point to which Kane, at page 299, gives a height of 300 feet; at page 305, of 480 feet; and lastly, at page 307, where he compares it with the points from which former expeditions are supposed to have seen the open sea, of 580 feet. How this very doubtful height was measured, is not mentioned, and yet it is from this position that the size of the surveyed *open* space is to be given. Nor have I been able to find due information of how clear the air was, nor where the sun was at that time. Morton speaks of a dark rain-cloud in the n.w.; and a delineation of the open sea, with Morton in the foreground, "*from description*," as it is called, is also given at page 307. But with the exception of a mysterious round body bathing one half in the sea, but which cannot be the sun at this season of the year, a long way above the horizon, even at midnight, one sees nothing but the sea bounds bordering the horizon. Neither is it quite clear in what



direction the oft-mentioned Cape concealed the prospect towards the east. We see the coast-line on the chart broken abruptly off by the farthest point that Morton saw. We ought to have the necessary information about all these questions in order to judge of the correctness of the calculations by which Kane, at page 302, came to the result, that Morton could see from his "look-out" to a distance of 36 miles, and that he had consequently surveyed an Open Sea of more than 4000 square miles. Every one acquainted with the nature of "looking out" after ice will admit the folly of determining with certainty, by sight alone, from a height of some few hundred feet, that flat ice is not to be found on the sea in the farthest margin of the horizon, or at a distance of 36 miles. If even, as I much doubt, it could be possible, under very favourable circumstances, to discover it at such a distance if it were there, it however becomes an impossibility to determine its absence with certainty. If we now remember that the part of the sea which Morton had already passed, after he left the Humboldt glacier, was kept open by the strong current, that this stream-hole must be regarded as one of the most unusual on account of its breadth, and that it is not at all decided if this strong current did not continue past Cape Jefferson, on which he stood, it appears probable that such a stream could continue its thawing activity far past this point; and even if it were correct that there had not been ice 36 miles out before this channel-opening, there is, however, no reason to seek such distant causes as those which the author has assigned in order to explain this phenomenon in another manner. Should there really be an open Polar basin in the summer, or at certain other periods, there is at all events no reason to suppose that this Open Sea had been reached by this expedition.

In conclusion, let me touch on the coasts discovered on this expedition, as represented on the chart at the beginning of the first volume. They who know how deceptive it is to look at the configuration of such high mountains at a distance from the sea, how all melts together, islands are taken for continents, promontories for islands, and deep spacious fiords and sounds quite disappear, will certainly agree with me in admiring the boldness with which the opposite coast, from Cape John Barrow to Mount Parry, an extent of more than two degrees of latitude, which they approached at the very nearest, at a distance of 25 to 40 miles, is found marked out on the said map as a clearly defined connecting shaded line, making only a little curve towards the east, in order to limit the Open Polar Sea, and, as if to receive the Gulf-stream, said to flow from Nova Zembla, and lead it down through Smith Strait to Baffin Bay. The heights of the mountains,

according to the guessed distances, are on the other hand just as remarkable as determining the distances without knowing the heights of the mountains. The farthest mountain-top that Morton saw—"the most remote northern land known upon our globe"—has been put at 2500 to 3000 feet, and 100 miles from Morton's last station. Notwithstanding this great distance Morton saw however that the top was bare, and that it was striped vertically with projecting ledges. Beyond this *ultima Thule*, about 60 to 80 miles from Morton's farthest station, and as it seems partly behind the Cape which stopped his view, is indicated "*open sea*." Had Morton only passed round his Cape he would possibly have seen fresh capes shooting forth incessantly until he reached Mount Parry, which might have been thus connected by a neck of land with Greenland, and again on the other side large bays and sounds might have opened themselves on the American side and broken off the line now so nicely laid down on his map.

I have thus exhausted the most important points respecting these discoveries, which are represented as the crowning glories of the expedition. These Polar expeditions were dispatched for the discovery of the North-West Passage and of the remains of the Franklin Expedition, and both these problems have been solved by British enterprise. So far as they fall short of the finding the remains of Franklin or of the North-West Passage, they do not promise any advantages that can in any way answer to the means and efforts they demand.

Dr. Kane has undeniably gone beyond what he promised in his preface, namely, to give a simple narrative of the adventures of his party; and he has hereby, in my humble opinion, injured more than benefited his work; and the numerous really interesting and remarkable elucidations concerning the nature of North Greenland, obtained by immense labour and rare efforts, are thereby in a manner cast in the shade. Every one who interests himself for the Arctic regions will, in Kane's work, find valuable contributions to their description. Let me, among others, especially point out the description of the mode of life of the inhabitants of those northern regions; the remarkable abundance of walrus, bears, and other animal life; the observations on the growth of plants, and on the temperature, as well as those respecting the formations of ice on sea and land, &c. &c.\*

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\* See "Proceedings" R. G. S., vol. ii. pp. 195 and 359, also vol. iii.—ED.